Coping with the Dynamics of Open, Social Media on Mobile Devices with Mobile Facets

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ABSTRACT

When traveling to a foreign city or wanting to know what is happening in one's home area, users today often search and explore different social media platforms. In order to provide different social media sources in an integrated manner on a mobile device, we have developed Mobile Facets. Mobile Facets allows for the faceted, interactive search and exploration of social media on a touchscreen mobile phone. The social media is queried live from different data sources and professional content sources like DBpedia, a Semantic Web version of Wikipedia, the event directories Eventful and Upcoming, geo-located Flickr photos, and GeoNames. Mobile Facets provides an integrated retrieval and interactive exploration of resources from these social media sources such as places, persons, organizations, and events. One does not know in advance how many facets the application will receive from such sources in a specific contextual situation and how many data items for the facets will be provided. Thus, the user interface of Mobile Facets is to be designed to cope with this dynamics of social media.

Keywords

Dynamics of Social Media, Mobile Computing

1. INTRODUCTION

The interaction paradigm of faceted search and exploration has been well studied on desktop computers in the last decades [3, 2, 4, 6, 11]. Facets divide a data space along its categories. By selecting facets, the result set is constantly narrowed down. This allows the users to easily handle a large amount of data.

When transferring the interaction paradigm of faceted search and exploration to the mobile world, one has to deal with additional problems due to limited interaction possibilities and smaller display size. These limitations are opposed to the complexity and dynamics of the facets and data items (resources) that are retrieved from the open social media data sources and that need to be visualized and explored. For example, in the social web, one wants to retrieve information about a city and its sights from Wikipedia[1], see photos related to the sights on Flickr[2], and explore events happening in the city from event directories like Upcoming[3] and Eventful[4]. These data sources are open as they offer besides a web-based user interface also access by some publicly available application programming interfaces, e.g., REST in the cases of Flickr and Upcoming. Other data sources have been translated into the Resource Description Framework (RDF)[5] format of the Semantic Web. For example, a Semantic Web version of Wikipedia is provided by DBpedia [1] and made publicly available through a SPARQL[6] endpoint. As the data is retrieved live, we do not know in advance the number and type of facets and data items. This requires an even smarter user interface and intuitive use of facets than on desktop computers. This is a problem, as providing an intuitive and easy to use mobile user interface for faceted search and exploration is hard.

In this paper, we present Mobile Facets for the interactive, faceted search and exploration of different, integrated social media sources on a touchscreen mobile phone. The Mobile Facets application allows for retrieving entities such as places, persons, organizations, and events from an integration of DBpedia, Eventful, Upcoming, and geo-located Flickr photos and professional content from GeoNames[7]. In order to cope with the dynamics of the resources retrieved live from the open social media data sources, the Mobile Facets application provides a flexible mobile user interface based on facets. The principle idea is to start with a small number of predefined high-level facets, namely Places, Persons, Organizations, and Events, and to fill them dynamically with the facets and resources retrieved live from the social media data sources.

2. ITERATIVE PROTOTYPE DESIGN

Starting with a paper-based mock-up prototype, we have created and continuously improved a running prototype that a small group of five users have tried out on a touchscreen mobile phone. The age of the users is between 26 to 35 years (avg.=29.75, SD=4.11). The experience in using mobile phones in the group is between good to very good. In addition, two users are experts on user interfaces. We have developed our Mobile Facets application under Google's Android operating system and tested it on a Motorola Milestone XT720.

[1] http://www.wikipedia.org/
[2] http://www.flickr.com/
[3] http://www.upcoming.org/
[4] http://www.eventful.org/
[5] http://www.w3.org/TR/REC-rdf-syntax/
[6] http://www.w3.org/TR/rdf-sparql-query/
[7] http://www.geonames.org/

In the following, two of the most important design decisions are discussed in more detail. These are designing the users' interaction for searching and exploring the open social media data using facets and visualizing selected facets.

2.1 Search and Exploration Using Facets

Goal of the search and exploration using facets is to enable the users to find interesting places, persons, organizations, and events in their vicinity through a poly-hierarchy of facets. When navigating in multiple facet hierarchies, users should still be able to keep track of the choices they made and should not feel lost. To achieve this, we have created three different design variants for our mobile search and exploration using facets. In all variants, the users start with the high-level facets Places, Persons, Organizations, and Events.

In the first design variant shown in Figure 1a, the user clicks on a high level facet such as Places. By this, the user navigates into the facet hierarchy and the sub-facets of Places are shown such as Populated Places, Area, City, and so on. For each facet, the number of results is shown such that the user knows which sub-facets are more populated than others. In the second design variant shown in Figure 1b, the facets are selected by means of pull-down menus. First, a high-level facet is selected like Places. Then, a pull-down menu appears showing the sub-facets of the previously selected facet. The users can select a sub-facet from the list to further refine the result list. The last design variant divides the screen into several smaller areas for facet selection and exploration. The user starts at the top-left corner to choose from a high-level facet like Places. Subsequently, the right hand side is filled with the sub-facets and the users can choose one from it like Historic Places. The result list is then further narrowed down in the bottom left part of the screen.

The user group found it in principle useful to navigate by means of lists of facets. This was seen as a strong advantage of the first design variant by most users. But the users mentioned that the font should be large. It was also mentioned that it might be cumbersome to navigate through multiple hierarchies of facets which may contain large lists of sub-facets. Advantage of the second approach is that the users see which (sub-)facets have been selected. However, the users disliked that the drop-down menus are dynamically added to the screen. In addition, selecting items from the drop-down menus was considered cumbersome. In the third design variant, again the users can keep track of the interactions, i.e., the facets they have selected. However, the problem is that the available space of the screen is limited and thus the interaction with the mobile phone is difficult.

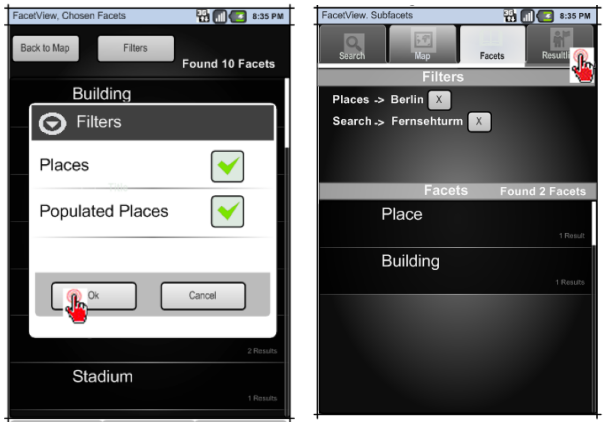
From the three design variants the best rated was the first one. The only disadvantage with the first design variant is that the users do not see which facets were previously selected.

2.2 Visualizing Selected Facets

In order to support users in keeping track of the facets they have selected, the current state of the system needs to be shown to them appropriately. The user group has been presented two different design variants A and B showing how the selected facets can be visualized.

The design variant A is created such that it can be applied together with all three design variants for faceted search and exploration as presented in the previous section. To see the currently selected facets, the users can click on the "Filter" button shown in the top of the screenshots of Figure 1a to 1c. Please note that at that time of the system design, the term "filter" was used to show the currently selected facets. During the iterative design, we have asked the subjects if they would prefer the alternative term "facet" instead. As the latter was considered more appropriate (only one subject disagreed), we use the term facet in the final prototype. Subsequently, a menu pops up depicting the currently selected facets as shown in Figure 2a. The selected facets are, e.g., Places and its sub-facet Populated Places. To unselect a facet, the checkboxes at the right hand side can be used. When sub-facets such as Populated Places are removed, the system falls back to the higher-level facet, in this case Places. However, when unselecting the facet Places, also the facet Populated Places is unselected as it is a sub-facet of it.

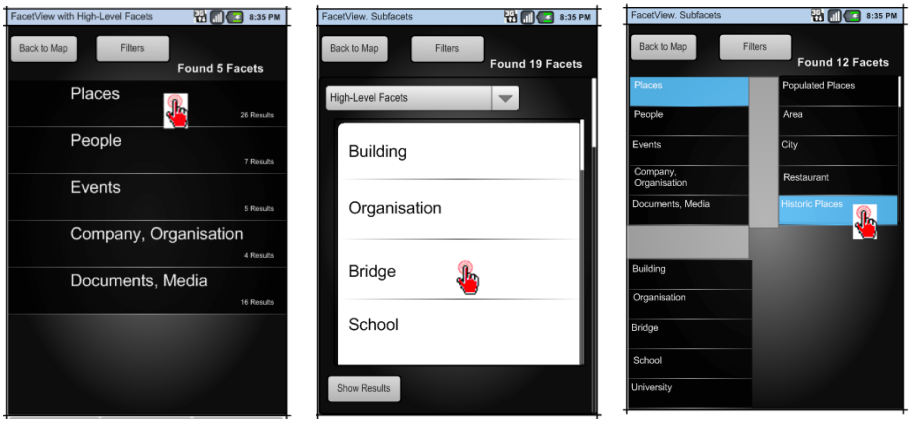
In the design variant B depicted in Figure 2b, the currently selected facets are shown together with the search and exploration via facets as depicted in Figure 1a. The user has selected the high-level facet Places and has further narrowed down the result list by choosing the sub-facet Berlin. We have also added a keyword search, in this example a specific kind of sights, namely transmission towers (Search → Fernsehturm). The facets can be unselected, by clicking on the "X" button on the right hand side of it.



(a) Variant A (b) Variant B

Figure 2: Different Variants for Visualizing Selected Facets

In the design variant A, it was clear how to unselect facets. However, the users did not found it intuitive that the facet Populated Places is a sub-facet of Places. Although a keyword-based search like for the transmission towers was appreciated in general, integrating it into the selected facets as shown in the design variant B (Figure 2b) was not considered useful. In general, however, the design variant B was considered more intuitive and chosen for the final prototype.



(a) Variant 1 (b) Variant 2 (c) Variant 3

Figure 1: Different Variants for Search and Exploration Using Facets

3. FINAL IMPLEMENTATION OF THE MOBILE FACETS PROTOTYPE

We present in this section the final design and functionality of the Mobile Facets prototype along the tabs it provides, namely faceted search and exploration, map view, result list view, and photo view. Finally, we present the details view of resources. The users can switch arbitrarily between the tabs by clicking on the corresponding icon at the top of the application.

3.1 Tab 1: Faceted Search and Exploration

When starting the Mobile Facets application, the first tab for faceted search and exploration is shown to the user as depicted in Figure 3a. The screen is divided into two parts: In the upper area, the facets and sub-facets selected by the user are shown. In the example in Figure 3a, the user has selected the facets Educational Institution and Museums in Berlin. The resulting resources are all organizations of educational background merged with all places that are museums in the city of Berlin. By clicking on the cross next to the facets, the entire facet is removed. In addition, the user can remove all currently selected facets or add a new facet using the "+" icon. In order to avoid empty result lists when searching and exploring using facets, the number of items retrieved, i.e., the number of sub-facets or instances is shown under the facets. For example, there are eleven Museums in Berlin.

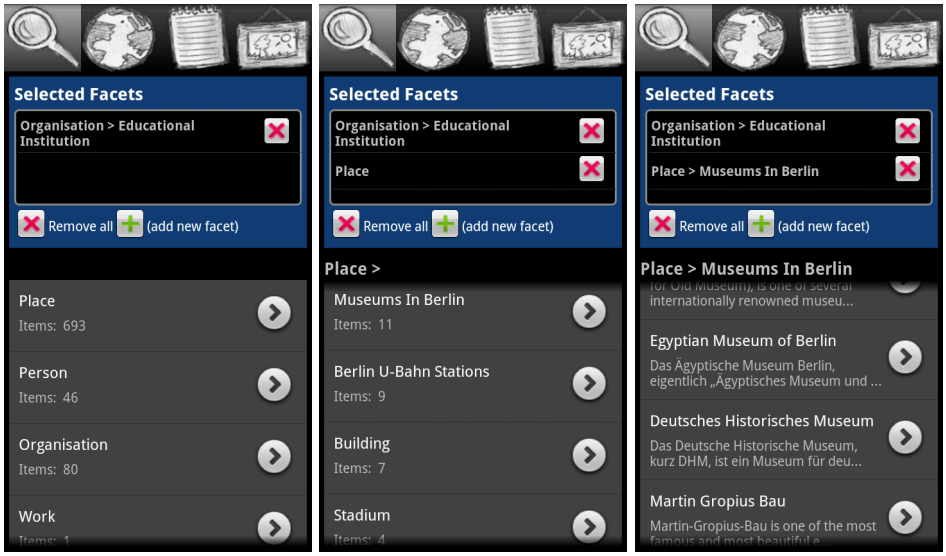
The lower area of Figure 3a shows the available facets and allows the users to select and explore the information space using facets. The facets are initially filled when starting the application or by executing a "What's around me?" query from the applications menu (no screenshot provided). One starts with selecting a high-level facet and narrows down the result set using sub-facets. Figure 3a (left) shows the high-level facets Places, Persons, Organizations, and Events and the selected facet Organisation → Educational Institution. The user selects the high-level facet Place. Subsequently, the sub-facets of Place in Berlin such as Museums in Berlin, Berlin U-Bahn Stations, and others are shown as depicted in Figure 3a (middle). The user clicks on the facet Museums in Berlin and the instances of this facet are shown as depicted in Figure 3a (right). By clicking on one of the instances, the details of this resource are shown as described in Section 3.5.

3.2 Tab 2: Map View

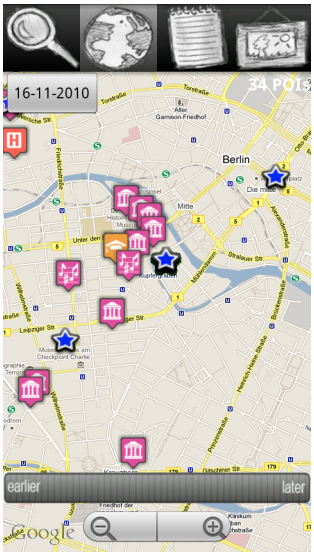
Once the users have selected appropriate facets using the tab described in the previous section, they can visualize the results on a map. To this end, the users click on the map view tab, which allows standard map-based interaction such as zooming and panning as depicted in Figure 3b. The map view shows all search results that have a geo-location like places and organizations. When clicking on a point of interest, its details are shown as described in Section 3.5. The blue stars shown on the map are events, i.e., point of interests that are of interest during a specific period of time like a concert or an exhibition. The Mobile Facets application provides a novel time-slider widget [7] to browse through time, which is located at the bottom of Figure 3b. The events are rendered depending on the temporal distance to the currently selected date of the time-slider widget. Events happening today are shown in shaded blue-red whereas events happening up to 30 days in the future are more and more lightened up. This provides the users immediate feedback when events are happening while operating the time-slider widget.

3.3 Tab 3: Result List View

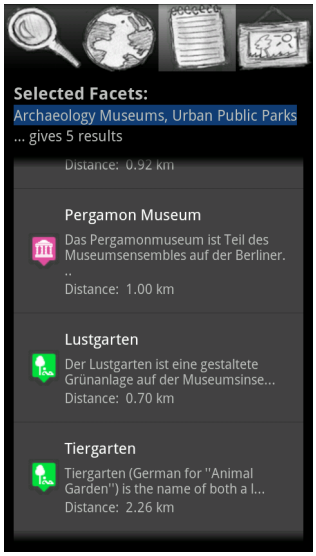
Besides a faceted search and exploration and map view of the results, there is also a plain list view of matching resources as shown in Figure 3c. It contains all resources of the currently selected facets as described in Section 3.1. The resources shown in the result list view can be any instances of the high-level facets or its sub-facets. In the example, the facets Archaeology Museums and Urban Public Parks in Berlin are selected and its five results are shown in the list. The users can click on the results, which again opens the details view.



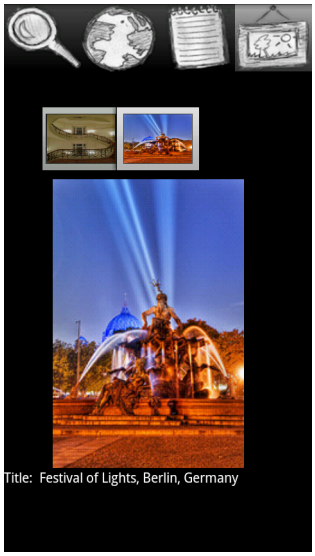
(a) Faceted Search and Exploration View: High-level facets, Sub-facets, and Instances



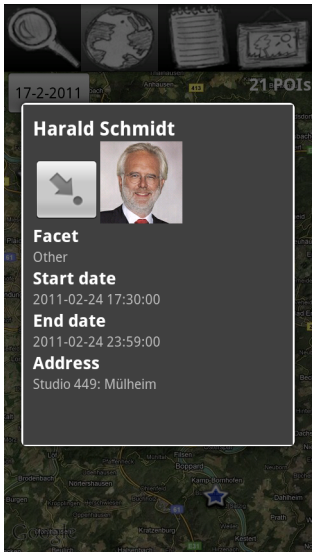
(b) Map View with POIs and Events



(c) Result List View Showing Places in Berlin



(d) Photo View



(e) Details View

Figure 3: Mobile Facets Application

3.4 Tab 4: Photo View

The photo view depicted in Figure 3d is the last tab in the Mobile Facets application and shows images from Flickr that have been taken in the vicinity. A gallery of photos is shown at the top. Users can scroll through it and click on images they like to see in larger resolution.

3.5 Details View

The details view of a resource can be opened from all tabs of the Mobile Facets application. Depending on the type of resource, the details view shows different information: For DBpedia resources, i.e., places, organizations, and persons described on Wikipedia, the details view provides a title, thumbnail (if available), link to the article's web page, abstract, and others. As an example, Figure 3e shows the details of an event with Germany's entertainer Harald Schmidt. The users can click on the photo icon to switch to the photo view. For resources with a location, also an icon to switch to the map view is provided. For event resources, the details view shows the event category, start date, end date, address of the venue, and the event description (no screenshot provided).

4. DATA INTEGRATION

As data corpus, we use publicly available sources of social media data and a geo-location website, namely DBpedia, the event directories Eventful and Upcoming, geo-located Flickr photos, and content from GeoNames. The data is queried and integrated live from the data sources. Thus, we cannot make any assumptions about which facets and how many data resources the Mobile Facets application receives in a specific contextual situation. The data is social as it is generated by users, but with GeoNames, Eventful, and Upcoming it also contains professional data.

The data infrastructure of Mobile Facets is designed such that it allows for an easy integration of further open (social media) data sources available via, e.g., REST interface or SPARQL endpoint. However, at the moment, the abstract categories of the social media data sources are manually associated with the high-level facets of Mobile Facets, namely Places, Persons, Organizations, and Events. In a future extension of Mobile Facets, we plan to replace this initial hardwiring of the social media data sources and the high-level facets by a dynamic mapping.

5. RELATED WORK

FaThumb is a keypad-driven application for mobile faceted search and exploration [5]. The search result is narrowed down iteratively by using the number keypad of the mobile phone. Due to the time when FaThumb has been developed, it does not provide a GPS-based map view or a rich media view, e.g., for showing pictures of the selected items.

With mSpace Mobile, we find a pen-based mobile application for faceted search and exploration of location-based information [9, 10]. It is designed for personal digital assistants running Microsoft Windows Mobile. The user interface is divided into tiles. Each tile shows one aspect of the information space such as a list of points of interests, a map, or metadata. The upper tiles serve as navigation within the available facets. By selecting them, the content of the lower tiles changes such as points of interests on the map and information about the selected facet.

The Mobile Cultural Heritage Guide [8] is a tourist guide application for Amsterdam providing an augmented reality view. Users can explore the artists that have lived and worked in the city and have a look at the places today from the perspective of the painters in former times. The application is specifically designed for the cultural heritage domain and does not provide a generic interface for mobile faceted search and exploration. Thus, the Mobile Cultural Heritage Guide does not provide a flexible user interface to cope with, e.g., a dynamically filled list of sub-facets where the number of sub-facets is not known in advance or might contain many entries.

In contrast to the prior work, we present in this paper a generic user interface for faceted search and exploration in a large, multi-dimensional information space of social media data on a touchscreen mobile phone. We do not assume to know in advance what kind of facets the users will receive and how many facets and resources one finds at a given user location. This is due to the fact that we query the social media data sources live and are not using any predefined, closed data set.

6. CONCLUSIONS

In this paper, we have presented Mobile Facets, a mobile application for faceted search and exploration of a large data set of open social media data on touchscreen mobile phones. The data is retrieved live from different sources allowing to apply Mobile Facets at any location in the world covered by Wikipedia, GeoNames, Eventful, Upcoming, and Flickr. The design of an application for faceted search and exploration on a mobile device was significantly harder and more complex than for a desktop computer. This is due to the fact that the interaction possibilities with the mobile device are limited and the display size is smaller. In addition, the Mobile Facets application has to cope with the dynamics of the data, i.e., the fact that one does not know in advance the number and type of facets and resources retrieved live from the integrated open social media sources.

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